Assigned reading: Chapter 17 of Gallian.

Recommended practice questions: Chapter 17 of Gallian, exercises
27, 28, 35

Supplementary Exercises for Chapters 15-18
11, 13, 19, 25

Assigned questions to hand in:

1. (Gallian Chapter 17 # 8) Suppose that $f(x) \in \mathbb{Z}_p[x]$ and $f(x)$ is irreducible over $\mathbb{Z}_p$, where $p$ is prime. If $\deg f(x) = n$, prove that $\mathbb{Z}_p[x]/\langle f(x) \rangle$ is a field with $p^n$ elements.

2. (Gallian Chapter 17 # 25) Find all the zeros and their multiplicities of
   \[ x^5 + 4x^4 + 4x^3 - x^2 - 4x + 1 \]
   over $\mathbb{Z}_5$.

3. (Gallian Chapter 17 # 33) Let $F$ be a field and let $p(x)$ be irreducible over $F$. Show that
   \[ \{a + \langle p(x) \rangle : a \in F\} \]
   is a subfield of $F[x]/\langle p(x) \rangle$ isomorphic to $F$.

4. (Gallian Supplementary Exercises for Chapters 15-18 # 12) Is the homomorphic image of a principal ideal domain a principal ideal domain?

5. (Gallian Supplementary Exercises for Chapters 15-18 # 20) For any integers $m$ and $n$, prove that the polynomial $x^3 + (5m + 1)x + 5n + 1$ is irreducible over $\mathbb{Z}$.

6. (Gallian Supplementary Exercises for Chapters 15-18 # 23) Is $\langle 3 \rangle$ a maximal ideal in $\mathbb{Z}[i]$?